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order must again be changed (969); nay, more, that with the same acid, and merely by changing the proportion of dilution, such alteration of the order must take place (974, 976).

980. Thus it appears, as before remarked (970), that to apply the theory of contact electromotive force to the facts, that theory must twist and bend about with every variation of chemical action; and after all, with every variety of contact, active and inactive, in no case presents phenomena independent of the active exertion of chemical force.

981. As the influence of dilution and concentration was so strong in affecting the relation of different parts of the same metal to an acid, making one part either positive or negative to another, I thought it probable that, by mere variation in the strength of the interposed electrolyte, the order of metals when in acids or other solutions of uniform strength might be changed.

I therefore proceeded to experiment on that point, by combining together two metals, tin and lead, through the galvanometer (903); arranging the electrolytic solution in tube No. i, strong on one side and weak on the other: immersing the wires simultaneously, tin into the strong, and lead into the weak solution, and after observing the effect, re-cleaning the wires, rearranging the fluid, and reimmersing the wires, the tin into the weak, and the lead into the strong portion. De la Rive has already stated<sup>7</sup> that inversions take place when dilute and strong sulphuric acid is used; these I could not obtain when care was taken to avoid the effect of the investing fluid (906): the general statement is correct, however, when applied to another acid, and I think the evidence very important to the consideration of the great question of contact or chemical action.

982. *Two metals in strong and weak solution of potash.*—Zinc was positive to tin, cadmium, or lead, whether in the weak or strong solution. Tin was positive to cadmium, either in weak or strong alkali. Cadmium was positive to lead both ways, but most when in the strong alkali. Thus, though there were differences in degree dependent on the strength of the solution, there was *no inversion* of the order of the metals.

983. *Two metals in strong and weak sulphuric acid.*—Cadmium

was positive to iron and tin both ways: tin was also positive to iron, copper, and silver; and iron was positive to copper and silver, whichever side the respective metals were in. Thus none of the metals tried could be made to pass the others, and so take a different order from that which they have in acid uniform

<sup>1</sup> *Annales de Chimie*, 1828, xxxvii. p. 240.